Methylmercury in Sport Fish:
Answers to Questions on Health Effects

Methylmercury is an organic form of mercury that is found in many fresh and salt-water organisms including fish. It is toxic to humans when consumed at high levels. In some coastal lakes and in the San Francisco Bay and Delta region, methylmercury has been found in some fish species at concentrations that may harm your health. The Office of Environmental Health Hazard Assessment (OEHHA) has issued health advisories to warn fishermen and their families to limit how much they eat of the affected fish species in these areas. These advisories include more restricted eating limits for pregnant women, nursing mothers, and children under six years because of the greater sensitivity of fetuses and young children to methylmercury.

Where does methylmercury in fish come from?
Methylmercury in fish comes from mercury in the aquatic environment. Mercury is widely found in nature and is commonly found in fish. One form of inorganic mercury is the heavy, silvery liquid used in thermometers. The coastal mountains in northern California are naturally rich in mercury, in the form of cinnabar ore. Mercury is released from the earth as a vapor, condenses in clouds, and then falls in rain. Rain water runs off the land, also carrying with it mercury from soil and rocks, and particularly from tailings from abandoned mercury mines. Mercury can also be released into the environment from industrial sources, but it is not known how much this contributes to methylmercury in fish.

In the water, inorganic mercury binds with proteins in plant and animal life forms and is converted to organic methylmercury. Fish take in some methylmercury directly from the water through their gills, but they acquire most of it from their food. Because of its nature, methylmercury accumulates in fish as they get older and bigger.

How might I be exposed to methylmercury?
Eating fish is the main way that you may be exposed to methylmercury. Exposure depends on the amount of methylmercury in the fish, and the how much and how often you eat fish. Other sources of mercury exposure may include drinking water or fumes in certain workplace settings, but for most people these sources of exposure are minor.

At what locations in California have elevated levels of methylmercury been found in fish?
Methylmercury is found in most fish. Some fish and some locations have higher amounts, however, and methylmercury is one of the chemicals in fish that most often creates a health concern. Fish consumption advisories due to high levels of methylmercury in certain locations have been issued in about 30 states. In California, methylmercury advisories have been issued in the San Francisco Bay and Delta and at the following inland lakes: Lake Nacimiento in San Luis Obispo County, Clear Lake in Lake County, Lake Berryessa in Napa County, Guadalupe Reservoir and associated reservoirs in Santa Clara County, and Lake Herman in Solano County. Other locations may be added in the future.

How does methylmercury affect health?
We know about the effects of methylmercury from serious poisoning incidents that have occurred in other countries. At Minamata Bay and Niigata in Japan in the 1950s and 1960s, factories discharged large amounts of mercury into bays, and people died or were made seriously ill from eating contaminated fish. In Iraq in the early 1970s, people were poisoned by eating contaminated bread mistakenly made from seed grain that was treated with phenylmercury.

Methylmercury mainly attacks the nervous system. In adults, mild symptoms can include loss of or abnormal sensation in the hands and feet, tiredness, and blurred vision. Severe

poisoning involves vision, hearing and speech impairment, and may later result in coma and death. Long-term exposure to methylmercury may cause kidney damage. You are not expected to have these symptoms from eating sport fish caught in California, even in locations where OEHHA has issued methylmercury advisories.

Pregnant women and nursing mothers can pass on methylmercury to their fetuses or newborns through the placenta or breast-milk. Because the placenta has a "trapping" effect, methylmercury is particularly hazardous for fetuses. Methylmercury can cause many types of problems in children, including decreased brain size, delayed physical development, mental impairment, abnormal muscle tone, and problems in coordination.

Children's brains do not complete development until after the age of five, and until that age, children are more sensitive to methylmercury exposure than adults. Therefore, the consumption guidelines are more restrictive for children as well as for pregnant women and nursing mothers.

Can mercury poisoning occur from eating fish in California?
The levels of methylmercury in California fish are much lower than those that occurred in Japan. At the levels in California, symptoms of mercury poisoning would probably not appear or be readily detectable. We are not aware of any cases of overt poisoning in California, nor would we expect them. However, we recommend following the fish consumption guidelines to protect against subtle and not easily detected adverse health effects. This is especially true in the case of fetuses and young children.

What is in the health advisories?
The health advisories provide guidelines for limiting fish consumption in particular areas. The guidelines usually specify how many meals, if any, may safely be eaten per week or per month of specific fish. Often the guidelines also specify lower eating limits for some population subgroups, such as pregnant or nursing women or children, because of their higher sensitivity.

In the case of methylmercury, fish size is important because some fish species prey upon smaller fish and in this way accumulate more of the chemical in their bodies. A very large striped bass, for example, may have 20 times higher a concentration of methylmercury than a small one.

The advisory issued for striped bass in the San Francisco Bay and Delta in 1993 is an example of how different eating limit guidelines were given for different age and population groups taking into account fish size (chemical concentrations) and special sensitivities. Adults in general were advised not to eat more than 2 to 4 pounds per month of fish 27 to 35 inches and no fish over 35 inches. Pregnant women, nursing mothers, and children under 6 were advised not to eat any fish over 27 inches and no more than 1/2 to 1 1/2 pounds per month of fish 18 to 27 inches, or none at all. Other consumption guidelines were given for children 6 to 15 years old.

Is there a way to reduce methylmercury in fish to make them safer to eat?
Fish should be cleaned and gutted before cooking because chemicals, including methylmercury, tend to concentrate in the guts, particularly in the liver. Unfortunately, there is not much else you can do to eliminate methylmercury in fish once it is there because methylmercury is bound up in the muscle of fish. Some other chemicals are stored in fat and can be reduced by getting rid of the fat. This is why OEHHA's general guidelines for making sport fish safer recommend trimming fat, removing the skin, and filleting the fish before cooking. We further recommend using a cooking method such as baking or grilling that allows the juices to drain away, and then discarding the cooking juices. Although these methods will not lower methylmercury levels, they are a good practice in case other chemicals that are stored in fat are present.

Our general guidelines also recommend fishing in different locations and eating different types of fish to reduce the chances catching fish in one place or eating one type of fish that is more contaminated. We do not yet know all the locations where contamination problems may exist.

How are the advisories being made available to the public?
The health advisories for sports fish are printed in the California Sport Fishing Regulations booklet, which is available wherever fishing licenses are sold. They are also available from OEHHA, including new updates and other information.

For the San Francisco Bay and Delta, OEHHA has organized an education task force consisting of representatives from state and local government, and sport fishing groups and environmental groups. Its task is to advise OEHHA on education and outreach activities such as posting warnings at fishing piers and translating printed materials into languages that are spoken by the local fishing populations.

Is there a medical test to determine exposure to methylmercury?
Mercury in blood and hair can be measured. This is not routinely done, however. Generally, it is only conducted to determine the extent of specific population exposures. Special techniques in sample collection, preparation, and analysis are required for these tests. For example, testing should differentiate between methylmercury, which is probably derived from fish consumption, and total mercury, which may be coming from other sources. For more information about medical testing and health effects, talk with your physician and your local health department.

Where can I get more information?
For more information on fish contamination in California, contact:

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1515 Clay Street, 16th floor
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(510) 622-3170

or the Sacramento office:

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our mailing address:
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County departments of environmental health may have more information on specific fishing areas.